

REMARKS/ARGUMENTS

Independent Claim 1 now recites a polymer that is prepared by polymerizing a monomer composition that contains the three components (i), (ii), and (iii) recited in the claim. The terpolymer of Claim 1 excludes monomer species other than those recited in the claim because the polymer is one that is prepared by polymerizing a monomer composition that “consists of” monomers explicitly recited in Claim 1, i.e., the terpolymer is described by a closed transitional phrase.

The Office Action of May 18, 2007 rejected the claims as anticipated and/or obvious in view of prior art including Sato (US 5,776,362); Takeda (US 5,587,415); and JP ‘405 (JP-10-309405). Applicants submit that present independent Claim 1 cannot be anticipated and/or rendered obvious by the prior art relied on by the Office at least because the compositions of the cited prior art are excluded by the presently claimed invention. For example, Sato discloses a sludge dehydrating agent that includes a copolymer that must have vinylic carboxylic acid monomer units. See for example the Abstract of Sato:

This dehydrating agent comprises a copolymer composed of cationic vinyl monomer units, vinylic carboxylic acid monomer units and nonionic vinyl monomer units and a salt of a group IIA metal of the Periodic Table.

Likewise, Takeda discloses a water-soluble cationic copolymer that must include the monomer unit of formula (1) disclosed at column 3, lines 1-17. The monomer unit includes substituents R_2 , R_3 and R_4 . R_4 must be a unit of formula $(CH_2)_nCH_3$ where n is an integer of from 3 to 9 (see line 16 of column 3 of Takeda). In contrast, present Claim 1 recites a dimethylamino propyl acrylamide that is quaternized with a C_1 to C_3 alkyl or alkylene group. The copolymer of Takeda is therefore excluded from the presently claimed invention because Takeda’s monomer unit of formula (1) is not one of the monomer units (i), (ii), or (iii) recited in present Claim 1.

According to the Office JP '405 describes a polymeric flocculent that must include the monomer unit of formula (1) described in paragraph [0004] of JP '405. The Office states that the JP '405 compositions must include "an anionic monomer such as (meth)acrylic acid" (see page 6, paragraph no. 8 of the May 18th Office Action).

The anionic monomer that the Office states must be present in the flocculent of JP '405 is excluded by the "consisting of" transitional phrase of the present claims. The presently claimed invention is therefore not obvious or anticipated by JP '405 because the presently claimed invention excludes the compositions described in the prior art relied on by the Office.

As Applicants have stated above, the presently claimed invention cannot be anticipated and/or rendered obvious by the cited prior art because the presently claimed invention excludes one or more components required in the prior art compositions.

Applicants submit that the presently claimed invention is further patentable over the cited prior art in view of the improved eco-performance achieved by the claimed invention. For example, the present specification discloses inventive and comparative examples whereby the improved performance of the claimed invention is shown. One measure of the improved performance obtained by the claimed invention is reflected in the cationic activity of polyelectrolytes that contain a terpolymer according to the claimed invention. Polymers 1-3 provide a useful comparison. The composition of polymers 1-3 is explained in the table on page 13 of the specification, reproduced below for convenience.

Polymer	Cationic monomers in wt%	Starting weight of Adame-Q	Starting weight of DIMAPA-Q	Starting weight of water
1	No ADAME-Q/ DIMAPA-Q			
2	ADAME-Q/ DIMAPA-Q 52.5:17.5	262.5 g	116.9 g	302.0 g
3	ADAME-Q/ DIMAPA-Q 35:35	175.0 g	233.3 g	347.0 g
Comparison polymer				
4	ADAME-Q/ DIMAPA-Q 17.5:52.4	87.5 g	349.5 g	327.0 g
6	ADAME-Q/ DIMAPA-Q 7:63	35 g	420 g	305.0 g

The components DIMAPA-Quat and ADAME-Quat correspond to components (ii) and (iii) recited in present Claim 1. Polymer 1 does not meet the present claim limitations and is a comparative example. Polymer 1 does not contain component (ii).

The cationic activity of the polymers is provided in the second table on page 18, reproduced below for convenience.

Polymer	Cationic activity after 1 h	Cationic activity after 1 day	Cationic activity after 3 days
1	28.6	< 1	< 1
2	31.9	15.6	5.5
3	37.7	28.3	9.5
4	47.8	43.7	39.9

Measured with Mutek PCD

The results shown in the table above make it clear that there is substantially improved cationic activity when the three components recited in present Claim 1 are present in the terpolymer of the claimed polyelectrolyte. Polymer 1 shows a quick decrease in cationic activity after only one day. The cationic activity of inventive polymers 2 and 3 however is much higher and more stable over the three day period of the test.

Although exhibiting improved cationic stability, the polymer-containing compositions of the invention concurrently exhibit improved the fish toxicity, e.g., the fish toxicity of the

inventive polymers is about the same as the comparative polymer. The fish toxicity is shown in the second table on page 19 of the specification, reproduced below for convenience:

Polymer	Toxicity LC ₅₀ (mg/l)
1	> 100
2	> 100
3	> 100
4	< 10
5	> 100 *

* no hydrolysis

The inventive polymers are therefore able to provide good cationic activity without a substantial increase in fish toxicity. Practically speaking, this provides a composition that is able to withstand longer storage times but does not negatively affect the environment when used in applications such as sludge dewatering and/or sewage treatment.

Applicants have therefore shown that the use of a terpolymer in a polyelectrolyte solution provides compositions that have significantly improved performance in applications such as sewage water treatment.

Irrespective of the improvements discussed above, the prior art relied on by the Office would not provide those of ordinary skill in the art with motivation to arrive at the presently claimed invention. For example, Sato discloses that recent changes in the compositions of sludge have made the use of cationic polymers unfavorable:

Previously dehydrating agents comprising cationic polymers have been known as sludge dehydrating agents. However, conventional dehydrating agents are becoming unsatisfactory in performance because of the recent worsening and diversification in sludge properties and, therefore, an improvement in the performance thereof has been sought.

See column 1, lines 14-19 of Sato.

Sato therefore teaches away from the presently claimed invention by disclosing that cationic polymers are unsatisfactory. As already stated above, the presently claimed invention requires the inclusion of a cationic terpolymer.

Takeda discloses that quaternary monomers that are substituted with C₃ or lower groups cause partial solubilization and therefore are not suitable for dispersion compositions:

Quaternary monomers obtained by the reaction of an alkyl halide having C₃ or lower carbon atoms are not suitable because the resulting polymer is partly soluble in the salt solution, whereas quaternary monomers obtained from an alkyl halide having C₁₁ or higher carbon atoms are also not suitable because they are insoluble in the salt solution.

See column 3, lines 49-54 of Takeda.

Takeda therefore teaches away from the presently claimed invention which requires a dimethylamino propyl acrylamide that is quaternized with a C₁-C₃ substituent. Applicants submit that those of ordinary skill in the art would not be led to the presently claimed invention from the disclosure of Takeda because Takeda discloses that problems with respect to solubility arise when C₁-C₃ substituents are present on one of the constituents of the monomer unit.

With respect to the Office's characterization of the compositions of JP '405, Applicants point out that the JP '405 polymers are amphoteric in nature (e.g., the prior art polymers contain both cationic and anionic monomer units). Applicants submit that those of skill in the art would not be led to form a terpolymer containing only the cationic units recited in present Claim 1 because such a polymer would fly in the face of Takeda's requirement for the inclusion of anionic monomer units.

In the Restriction Requirement the Office cited to Barabas (US 3,929,739) and stated that the claimed invention does not make a contribution over prior art polymers. The presently claimed invention excludes the polymers of Barabas because Barabas requires the inclusion of an ethylenically unsaturated monomer such as an acrylonitrile. The polymers of Barabas are excluded from the presently claimed invention and thus Barabas is no longer relevant in the examination of the present application.

For at least the reasons above, Applicants submit the presently claimed invention is patentable over the prior art relied on by the Office and request withdrawal of the rejections.

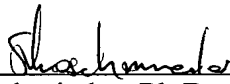
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